UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME   : HYDROLOGY

COURSE CODE   : DAC 20902

PROGRAMME CODE   : DAA

EXAMINATION DATE   : JUNE / JULY 2018

DURATION   : 2 HOURS 30 MINUTES

INSTRUCTION   : ANSWER **FIVE (5)** QUESTIONS
                        ONLY

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THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 (a) Define water balance equation as a modeling of hydrology.

(2 marks)

(b) Give **six (6)** locations of water storage in world water balance statistic.

(6 marks)

(c) Referring to **Table 1**, compute final water level (m) in rectangular sedimentation tank.

(4 marks)

(d) In 30 days data observation of 1000 acres reservoir has 2 inches precipitation rate. Average inflow into the reservoir was 5.9×10^5 m³/day and average outflow from the reservoir was 3.9 m³/s. Calculate the following:

(i) Area of reservoir (m²).

(2 marks)

(ii) Volume of precipitation (m³).

(2 marks)

(iii) Rate of inflow (liter/second).

(2 marks)

(iv) Change in storage (m³) in 30 days data observation.

(2 marks)

Q2 (a) Identify **two (2)** situations which rain gauges is inconsistent over a period time.

(2 marks)

(b) Explain produres to form Double Mass Curve.

(6 marks)

(c) Referring to **Table 2**, after four years, gauge D was relocated due to technical problem. Compute the adjusted precipitation at station D for the period from 2007 to 2010.

(12 marks)

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Q3   (a)   Define infiltration process which leads to groundwater storage.

(2 marks)

(b)   Explain rainfall simulator as an equipment to measure infiltration rate.

(6 marks)

(c)   Referring to **Table 3**, a storm produced a direct runoff of 145 mm in the 13 hectare of catchment area. Calculate:

(i) Rainfall intensity (mm/hr).

(2 marks)

(ii) Rainfall excess (mm/hr).

(8 marks)

(iii) Volume of rainfall excess (m^3).

(2 marks)

Q4   (a)   Describe the contribution of intensity duration frequency study in urban storm water management.

(3 marks)

(b)   Explain the procedure of Intensity Duration Frequency (IDF) Analysis.

(5 marks)

(c)   Referring to **Table 4**, determine the rainfall intensity (mm/hr) for 5-year and 10-year frequencies by using Intensity Duration Frequency (IDF) Method.

(12 marks)

Q5   (a)   Write **four (4)** fundamental assumptions in the use of unit hydrographs for modelling hydrologic system.

(4 marks)

(b)   Give **four (4)** uses of unit hydrograph in water management.

(4 marks)

(c)   Referring to **Table 5**, calculate the direct runoff (m^3/s) by using deconvolution method.

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(12 marks)

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Q6 (a) State **four (4)** parameters of groundwater storage.

(4 marks)

(b) Compare **two (2)** differences between hydraulic conductivity and transmissivity.

(4 marks)

(c) The soil under the dam consists of four layers as shown in **Figure Q6(c)**. Calculate the average conductivity (m/day) and transmissivity (m²/day) of the soil when water table is at the ground surface. Calculate:

(i) Average conductivity (m/day).

(4 marks)

(ii) Transmissivity (m²/day).

(2 marks)

(d) Referring to **Figure Q6(d)**, a fully penetrating 12 cm diameter well has its bottom 80 meter below the static ground water table. After 24 hours of pumping at 1100 m³/min, the water level in the test well stabilizes to 10 meter below the static water table. A draw-down of 3.65 meter is noticed in an observation (test) well 300 meters away from the pumped well. Determine the hydraulic conductivity of the aquifer (m/s).

(6 marks)

Q7 (a) Define flood routing process.

(2 marks)

(b) Explain **three (3)** functions of flood routing.

(6 marks)

(c) Referring to **Table 6**, analyze peak flow rates (m³/s) for 10-year return period by using Gumbel's method.

(12 marks)

- END OF QUESTIONS –

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Table 1: Data of Rectangular Sedimentation Tank

Item	Value
Initial water level	7 m
Volume of precipitation	22.5 m^3
Total of evaporation	300 mm
Width of tank	15 m
Length of tank	5 m

Table 2: Data of Annual Precipitation

Year	Annual Precipitation (mm)			
	A	B	C	D
2007	38	42	45	75
2008	45	45	45	35
2009	35	45	35	15
2010	45	40	40	25
2011	45	42	43	55
2012	30	30	40	45
2013	45	55	50	50
2014	30	40	50	40
2015	40	55	35	50
2016	55	35	40	50

Table 3: Data of Cumulative Rainfall

Time	1200	1300	1400	1500	1600	1700	1800	1900	2000
Cumulative Rainfall (mm)	0	10	32.5	70	127.5	172.5	212.5	237.5	250

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Table 4: Data of Precipitation

Year	Precipitation (mm)			
	15 min	30 min	45 min	60 min
2007	21	43	63	87
2008	29	45	61	83
2009	27	41	67	85
2010	25	47	75	95
2011	33	53	73	93
2012	35	57	77	97
2013	39	59	79	91
2014	37	55	71	99
2015	23	51	70	81
2016	30	49	65	89

Table 5: Data of UH Ordinates and Rainfall

Time	UH Ordinates (m^3/s.mm)	Rainfall (mm)
0700	-	-
0800	2	20
0900	8	60
1000	12	40
1100	40	
1200	212	
1300	60	
1400	28	
1500	20	
1600	8	
1700	4	
1800	2	

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Table 6: Data of Flowrate

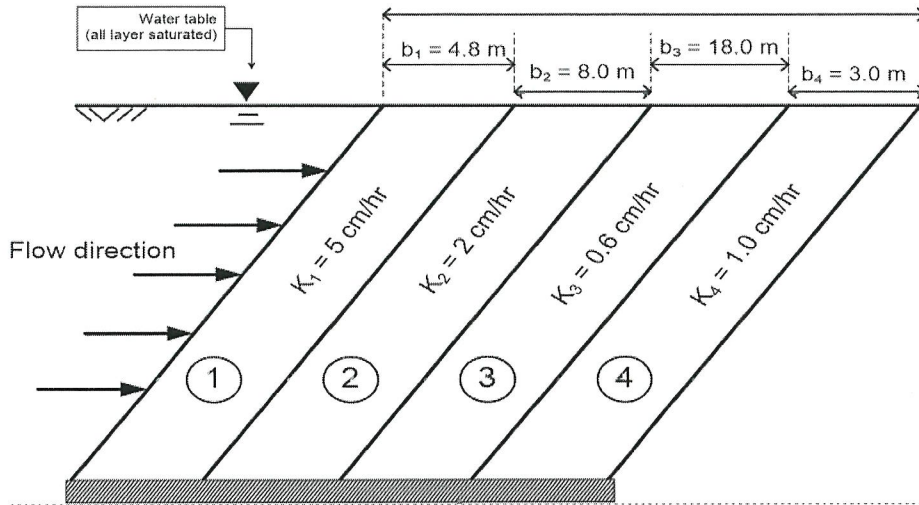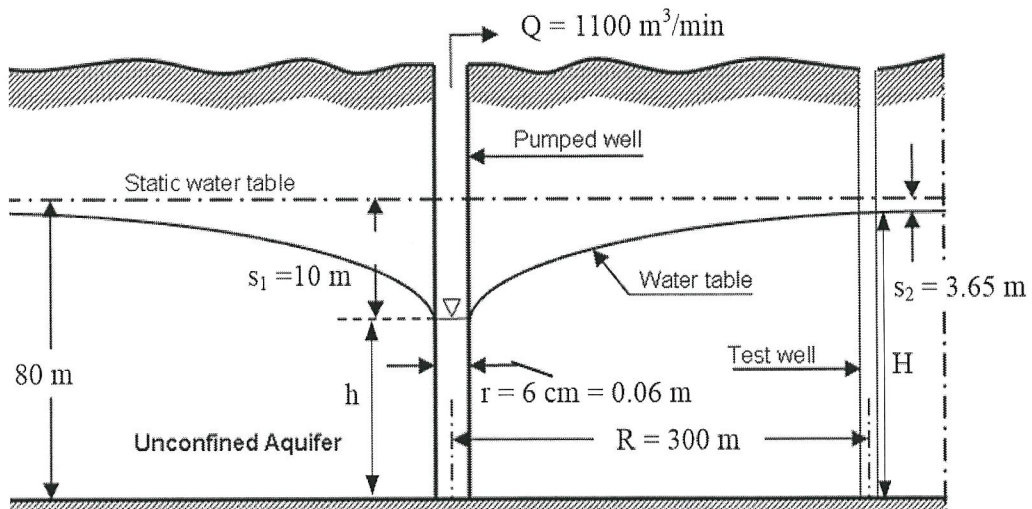| Year	Flowrate (m^3/s)
1997	19500
1998	9930
1999	14400
2000	20700
2001	20300
2002	16400
2003	19500
2004	20500
2005	11900
2006	8850
2007	9280
2008	17000
2009	12400
2010	14600
2011	30600
2012	1700
2013	22500
2014	17400
2015	15400
2016	15500

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Figure Q6(c): Four layers of soil

Figure Q6(d): Pumping well

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